

# VARYING DENSITY



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## WHY IS RESIDENTIAL DENSITY AN ISSUE?

Residential density has been a prominent issue in urban planning in NSW in the past decade for three major reasons.

- Cities in Australia, one of the world's most urbanised countries, are characterised by expansive suburbs with residential densities considered by international standards. The sustainability of this form of development has come into question over recent years.
- At the metropolitan and city-wide level, residential density is a key variable in determining policies for strategic issues such as land use and transport. Density affects the efficient use of urban resources and the effectiveness of investment of urban resources
- At the local level, urban consolidation policies aim to encourage higher densities. There has been debate within the development industry on the urban implications of higher density for urban areas and the range of house types able to realise these higher densities. Furthermore, trends in the demand for housing in the greater metropolitan region indicate a need for a greater mix of housing types and sizes in all local government areas

## MEASURING DENSITY

Density can be measured in several different ways, for example:

- Number of dwellings per unit area of land
- Number of residents per unit area of land
- Floor Space Ratio (FSR)

Each of these have different implications and can be used for different purposes.

Also, residential density can be measured using 'gross area' or 'net area', where net area excludes non-residential uses such as parkland or retail areas.

There are no agreed upon standards for what constitutes low, medium and high densities. A high density in Sydney might be a medium or low density in Tokyo, but for the purpose of this study we have used the following definitions:

**LOW DENSITY HOUSING:** Up to 25 dwellings per hectare

**MEDIUM DENSITY HOUSING:** 25 to 60 dwellings per hectare

**HIGH DENSITY HOUSING:** Over 60 dwellings per hectare

## LOW-DENSITY HOUSING

Low-density housing can range up to 24 dwellings per hectare (Wikipedia, Low-Density Housing )

### DETACHED HOUSE

Self contained dwellings with private open space, not attached to another building

#### Design

- Buildings should be designed so as to be compatible with the desired future neighbourhood character of the area.
- Each dwelling is to have private open space with direct connection to indoor living areas
- Buildings are generally not to exceed 6m in height (generally no more than two storeys).

#### Solar access

- The houses in low-density area have advantage to expose to sun-light more than any other areas due to lower building height and long distance between the neighbor

#### Privacy

- The broad street and open space in front of houses can give advantage to protect privacy from the outside.
- Trees or boundary walls can efficiently improve privacy protection.

#### Ventilation

- The buildings can be free from any obstacles to interrupt efficient ventilation.

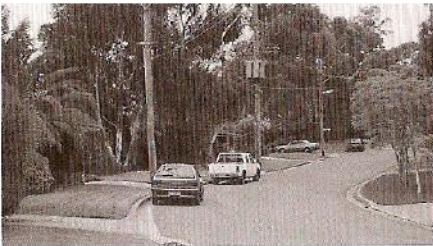
## CASE STUDY (Low-Density)

### Detached Houses in Westleigh



This area is an expensive quiet and spacious example of detached housing. The area is approximately 20km from the Sydney CBD.

Lots in Westleigh are wide but shallow. Side to side and back to back distances between houses are frequently tight.



Houses are well set back from the street and screened by planting. This enhances privacy but limits surveillance.



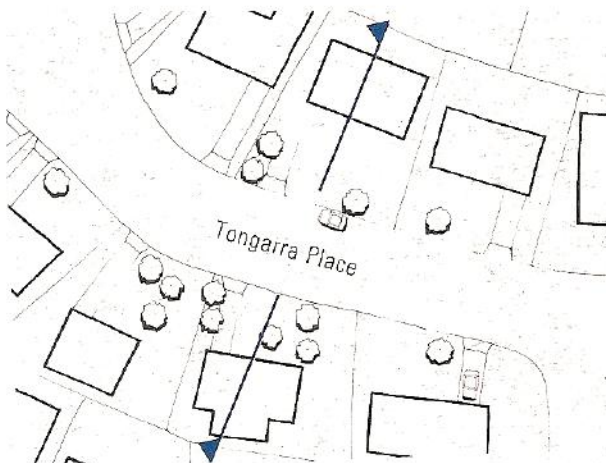
Typical detached two-storey house with garages integrated with the dwelling.



Study Area 1:5000

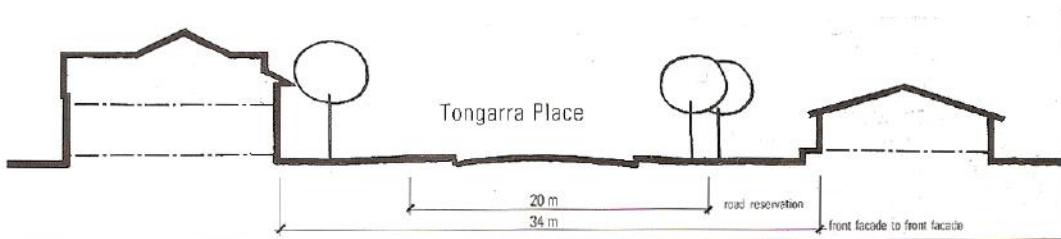
#### - Densities

Net residential density	11dw/ha
Net population density	37persons/ha
Occupancy density	3.4persons/dw
Gross residential density	4dw/ha
Local context (postcode 2120)	
Gross residential density	1.0dw/ha
Hornsby LGA	



Typical Street Portion 1:1000





Section 1:500

- Dimension: blocks, lots and roads

Typical street block size	3.95ha
Average lot size	680m <sup>2</sup>
Average lot width	23.5m
Average lot depth	29m
Typical road reservation	20m

- Built form characteristics

Proportion of predominant house type	100%
Average site coverage	36%
Typical distance front facade to front facade	34m
Average distance back facade to back facade	10m
Average distance side facade to side facade	4m
Average setback from front boundary	10m
Average building depth	16.5m
Range of building heights	1~2storeys

While many houses in Westleigh face the street, the general impression of the area is one of greenery and privacy as most houses are set back from the street and shelter behind mature trees.

## MEDIUM-DENSITY HOUSING

Medium density housing can range from about 25 to 80 dwellings per hectare and these developments may consist of detached, semi-attached and attached (or multi-unit) housing (Wikipedia,Medium-Density Housing)

MDH can be two and three-floor row houses and apartments up to around six floors.

### Design

- The siting and design of buildings and works should protect and enhance local amenity, areas of environmental significance and heritage places.

### Solar access

- Sufficient spaces in the flats should be designed to face North direction. (Buildings by increasing the upper level setback may allow more units to receive the advantages of a sunny aspect.)

### Privacy

- Private open space areas should be practical and usable having consideration for shape of open space,

### Noise Issue

- Ideally service rooms, rather than bedrooms, should face noise sources.

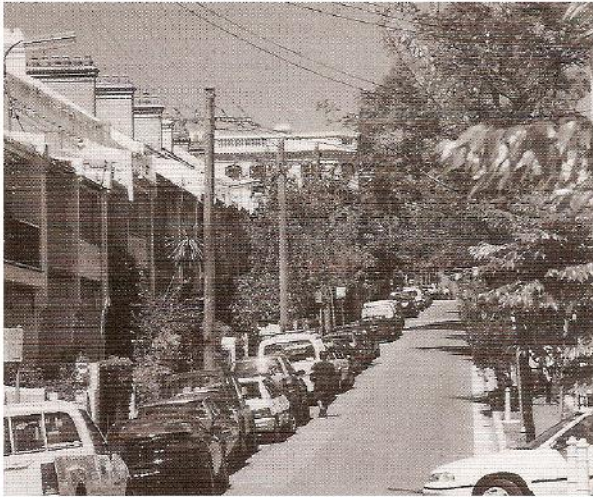
### Winds and Breezes

- Important information about winds and breezes should be gathered at the site analysis stage. Where a site has a history of prevailing cold winds from a constant direction, developments should be designed to be sheltered from these by the positioning of building forms, landscaping and treatment of openings such as doors and windows.



## CASE STUDY (Medium-Density)

### Attached Houses in Paddington



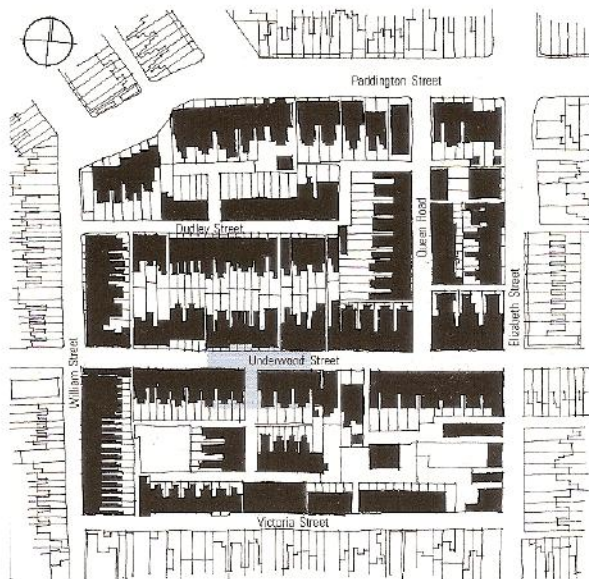
The image of Paddington results from the consistency and continuity of terraces edging long, straight streets.



Combination of small setbacks and two-storey terraces provides good opportunities for surveillance.



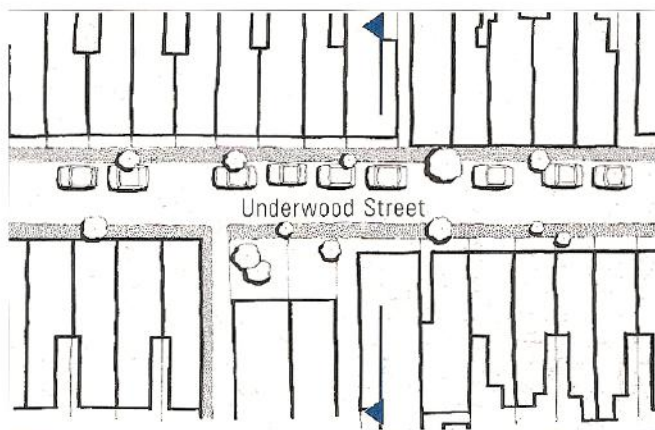
Pavement are narrow but frequently sheltered by trees



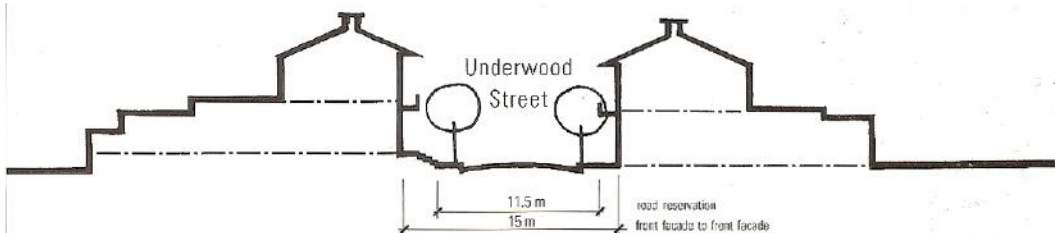
Study Area 1:5000

#### - Densities

Net residential density	56dw/ha
Net population density	114persons/ha
Occupancy density	2.3persons/dw
Gross residential density	15dw/ha
Local context (postcode 2120)	
Gross residential density	18.1dw/ha
Hornsby LGA	



Typical Street Portion 1:1000



Section 1:500

#### - Dimension: blocks, lots and roads

Typical street block size	1.99ha
Average lot size	220m <sup>2</sup>
Average lot width	7m
Average lot depth	31m
Typical road reservation	11.5m

#### - Built form characteristics

Proportion of predominant house type	95%
Average site coverage	65%
Typical distance front facade to front facade	15m
Average distance back facade to back facade	17.5m
Average distance side facade to side facade	0m
Average setback from front boundary	2.5m
Average building depth	24m
Range of building heights	1~3storeys

The paddington area is composed of almost terrace houses in a grid street. The combination of small setbacks from the property boundary with consistent two-storey surveillance over the public domain. Long back to back distance between houses limits overlooking and improves acoustic privacy.



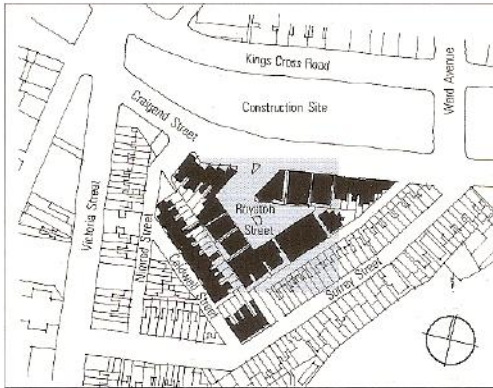
## CASE STUDY (Medium-Density)

### Low-Rise Flats in Darlinghurst



Above picture shows looking east into Royston Street Square. Flats are clustered around a small residential square with mature landscaping.

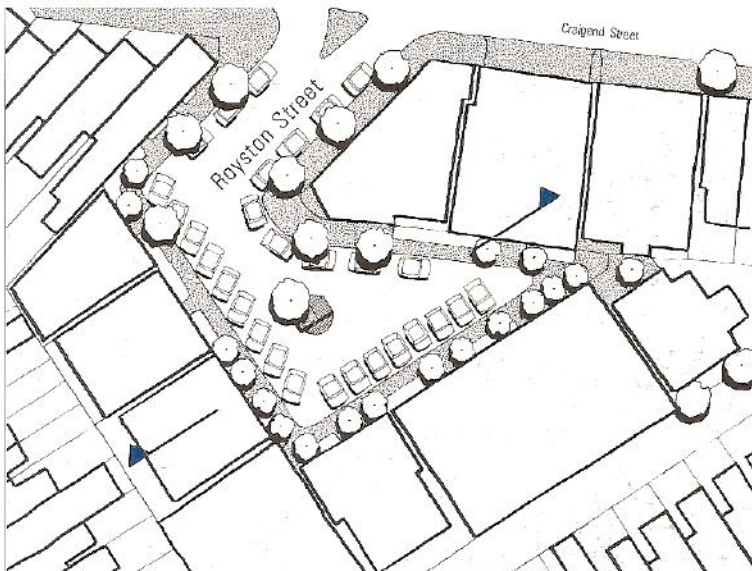




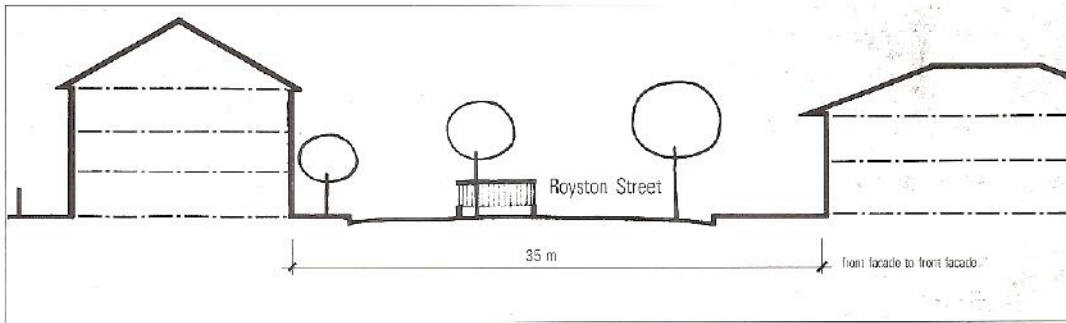
Study Area 1:5000

### - Densities

Net residential density	131dw/ha
Net population density	118.5persons/ha
Occupancy density	1.6persons/dw
Gross residential density	64dw/ha
Local context (postcode 2120)	
Gross residential density	20.7dw/ha
Hornsby LGA	



Typical Street Portion 1:1000



#### - Dimension: blocks, lots and roads

Typical street block size	0.76ha
Average lot size	280m <sup>2</sup>
Average lot width	14m
Average lot depth	20m
Typical road reservation	20m

#### - Built form characteristics

Proportion of predominant house type	80%
Average site coverage	84%
Typical distance front facade to front facade	35m
Average distance back facade to back facade	11.5m
Average distance side facade to side facade	0.5m
Average setback from front boundary	2.5m
Average building depth	17.6m
Range of building heights	2~4storeys

The darlinghurst area consists of 1920s and 1930s low-rise flats. Minimal setback from front property boundaries allows the flat buildings to enclose the square, creating a distinct sense of urbanity.



**Advantages**

- Densely populated areas make public transport and other services more efficient.
- Closer proximity to amenities reduces the need for car travel, reducing traffic congestion and pollution.
- Increasing densities in urban areas prevents sprawl and protects agricultural land and forests.

**Disadvantages**

- High densities can lead to overcrowding and lack of privacy, especially private outdoor space.
- Noise becomes an issue as people live in closer proximity to each other.
- Large areas of impermeable surfaces
- Heat island effect
- Perceptions of low safety levels
- Sanitation and waste disposal issues



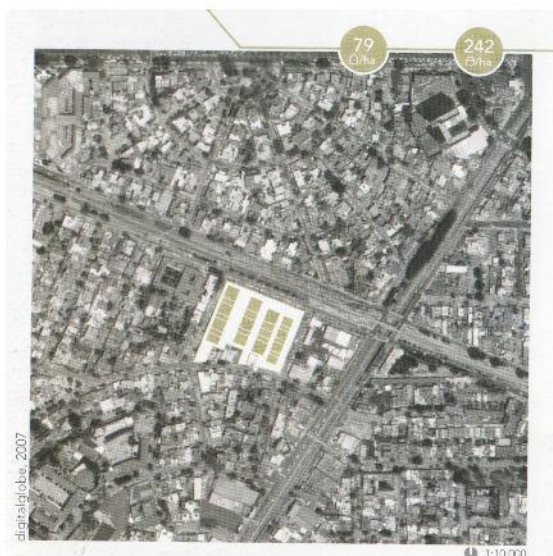
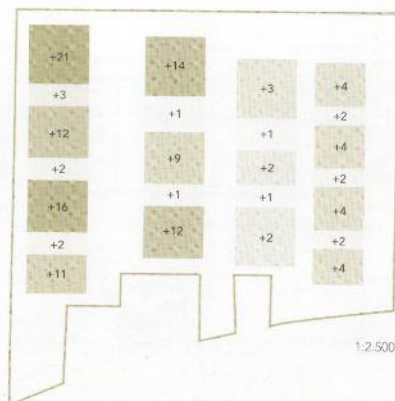
*The 16th-century city of Shibam, Yemen, is one of the oldest and best examples of urban planning based on the principle of vertical construction. Its impressive tower-like structures rise out of the cliff and have given the city the nickname of "the Manhattan of the desert".*

13.592 m<sup>2</sup>  
SUPERFICIE DE PARCELA  
PLOT AREA

62.250 m<sup>2</sup>  
SUPERFICIE CONSTRUIDA  
BUILT UP AREA

50 %  
OCUPACIÓN  
COVERED AREA

4,6  
EDIFICABILIDAD  
FLOOR AREA RATIO

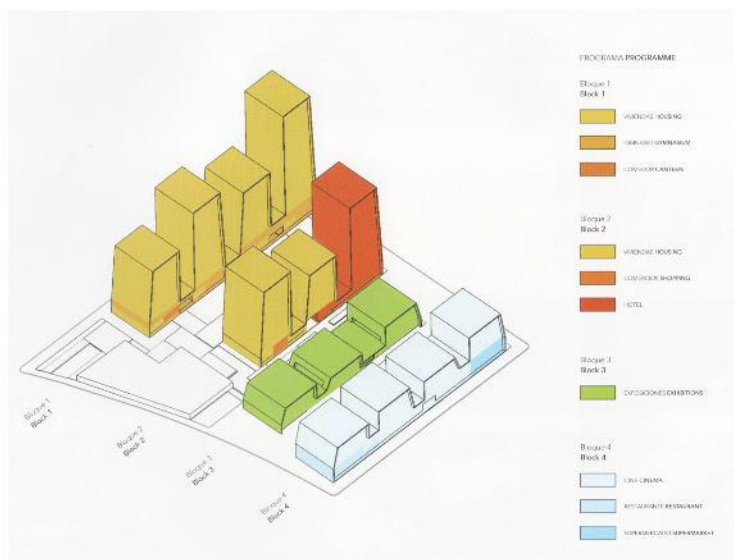


The program of this mixed-use centre is divided in four blocks: block 1 with four towers containing higher standard living; block 2 with three lower towers for the eco-hotel and apartments with halftime hotel service; block 3 with three volumes for a gallery and block 4 with four boxes for an art movie cinema.

The 4 blocks and their towers rise up from block 4 to block 1. In their irregular positioning they create an urban atmosphere within the area, which gives the complex an identity and coherence.

Tatiana Bilbao/mx.a [mx.a.com.mx](http://mx.a.com.mx)

Avenida Inglaterra 3089, Guadalajara, Mexico, 2006-2010



61.800 m<sup>2</sup>

SUPERFICIE DE PARCELA  
PLOT AREA

221.000 m<sup>2</sup>

SUPERFICIE CONSTRUIDA  
BUILT UP AREA

25 %

Ocupación  
COVERED AREA

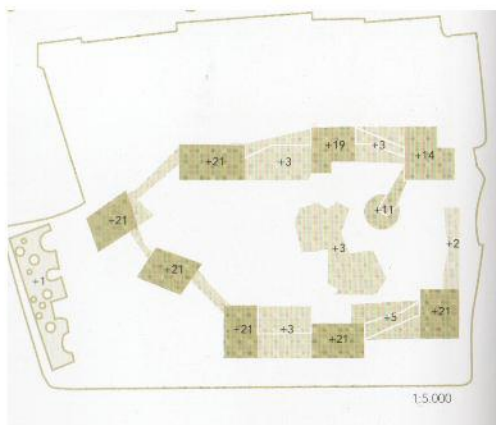
3,5

EDIFICABILIDAD  
FLOOR AREA RATIO

Filmic urban space: around, over and through multifaceted spatial layers, is one of the central aims of this Hybrid Building complex sited adjacent to the old city wall of Beijing.

Current development in Beijing is almost entirely -object buildings- and free standing towers. This -city within a city- envisions urban space as the central aim -as well as all the activities and programs that can support the daily life of its inhabitants. The eight towers are linked at the twentieth floor by a ring of services.

The undersides of the cantilevered portions are colored membranes in night light glow. Misty fountains from the water retention basin activate the night light in colorful clouds, while the floating Cineplex centerpiece has partial images of its ongoing films projected on its undersides and reflected in the water.



digital globe 2007

**Steven Holl Architects** [stevenholl.com](http://stevenholl.com)

East Xiba River Road, Beijing, China, 2003-2008





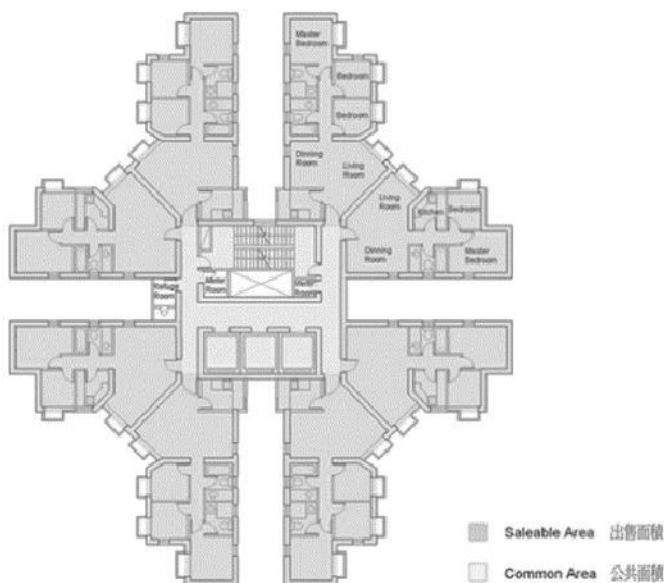
## HYPERDENSITY



*In Hong-Kong, average density is 120-950 dwelling units per hectare, in the metropolitan area.*

Due to booming economies and scarcity of land cities like Hong Kong have developed a hyper density with up to 950 dwellings per hectare.





*Typical floor plan*

Studies show that attempts to control density through floor space restrictions has lead to lower quality living spaces. As developers try to maximize the saleable floor area common areas, such as circulation space, and environmental control measures, like balconies and recessed windows, are minimised.

Though Singapore faces similar land scarcity problems, the average size of a three bedroom unit is 90 m<sup>2</sup>, compared to 50m<sup>2</sup> in Hong Kong.

Control items	Hong Kong	Singapore
Space quality standards	<p>Average 15.6 m<sup>2</sup> (saleable area) per person (Liu et al., 1999)</p> <p>Net size of a 3-bedroom unit is 50 m<sup>2</sup> (Griffiths, 2000)</p>	<p>Net size of a 3-bedroom unit is 90 m<sup>2</sup> (Griffiths, 2000)</p>

## VANCOUVER'S ECODENSITY INITIATIVE

BUILDING ON ITS PAST SUCCESSES IN POLICY AND PROJECTS INVOLVING WELL-DESIGNED DENSITY, the city of Vancouver launched an initiative, dubbed "EcoDensity," in 2006. This initiative embraces additional population growth within the city limits, done in a way that lowers environmental impact, supports sufficient physical and social amenities, and fosters housing diversity and affordability.

Densification effects change, so discussions of density always raise debate. Even in Vancouver—a city in which density has been done well in the past—concerns have been expressed that this is "eco-cramming." Some say the price of change is too high—that it will reduce the quality of life, promote gentrification, decrease affordability, and change the character of the city's neighborhoods. Others, however, champion the notion of "density done well" and point to the price of inaction: a growing lack of affordable housing and housing diversity, given that about half of the city land area is still zoned for single-family homes, and the ongoing challenge presented by global climate change. Although the resulting public debates have been challenging, they are necessary and healthy for any city intending to take ecological sustainability seriously.

Vancouver maintains high standards of urban design in denser areas to overcome the challenges posed by densification. The city also has a tradition of negotiating public benefits from developers in the form of community amenities. The combination of high-quality urban design, private provisions for public amenities, careful siting of new density types and scales relative to context, an emphasis on diversity, and engaged public discussions will continue to be the path that the city takes to move forward.—B.T. AND M.H.

Although the arguments for compact mixed-use development are convincing, the reality is that many people oppose almost all new development—and that opposition often increases with the density of the proposal, and its proximity to their property. Without an educated public that fully understands the effect of population growth and the consequences, challenges, and trade-offs inherent in land use decisions, support for regulations encouraging compact development will suffer. The benefits of compact development and the negative consequences of low-density development may not be readily apparent to the public, which often mistakenly blames higher-density development for the consequences of a low-density development pattern.

Generally, the public perception of high density is negative, but this often stems from misconception and bad examples from the past.

## 5. Hammarby Sjöstad, Stockholm, Sweden

Hammarby Sjöstad, being built on a 494-acre (200-ha) former brownfield site, is designed to have the same high density and built form as other inner-city districts in Sweden, at half the environmental impact of new Swedish communities typical of the 1990s. Laced with green spaces, dotted with green roofs and solar panels, and served by trams, buses, and a free ferry across the lake, Hammarby Sjöstad also showcases a creative new model for handling waste: residents sort household trash by type and drop it into vacuum-suctioned chutes near their homes, where it travels underground to the district heating plant for conversion into biofuels. The biofuels not only supply the district's heat and electricity, but also power some local buses, cars, and stoves in residential kitchens. The 12 subdistricts are each being developed by multiple developer/architect consortiums; about 10,000 residents already occupy the district, which is planned to reach a population of 25,000 over the next seven years.



## 8. Portico Scots Church Redevelopment, Sydney, Australia

Raising density sometimes requires reusing historic structures in creative ways. When construction of downtown Sydney's Scots Church began in the late 1920s, it was intended to rise 150 feet (45.7 m) high, but the economic stringencies of the 1930s curtailed the building to five stories. In the new millennium, Tonkin Zulaikha Greer Architects of Sunny Hills, New South Wales, made room for 126 apartments by renovating floors of the original church and using its structure as a base for modern towers. Developed by Perth-based Westpoint Corporation and completed in 2005, the towers step upward from eight to 21 stories to allow sunlight to reach the adjacent park. Renamed Portico, the development contains one-, two-, and three-bedroom units, many of them comprising two levels, with double-height windows that provide views and natural light while harmonizing with the vertical proportions of the original neo-Gothic facade. Some units look out onto winter gardens, acoustically buffered by exterior blinds and interior sliding glass doors that facilitate natural ventilation. The Scots Presbyterian Church still meets in the ground-floor auditorium.



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